# ECONOMIC GROWTH IN THE MIDDLE EAST AND NORTH AFRICA: AN INTERNATIONAL PERSPECTIVE

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# ECONOMIC GROWTH IN THE MIDDLE EAST AND NORTH AFRICA: AN INTERNATIONAL PERSPECTIVE[1]

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## ABSTRACT

This paper examines from an international perspective the growth experience of a group of "non-oil" economies in the Middle East and North Africa region—Syria, Jordan, Egypt, Tunisia and Morocco—over the period 1966-85. The empirical framework we use focuses on four central variables: per-capita income, investment, school enrollment and population growth. We estimate the relationship those variables have with each other as well as with other variables in a cross-section of nearly ninety countries, and ask whether our group of countries conform to this international pattern. The main regional features we uncover are: (1) Exceptionally high fertility rates compared to other countries at a similar stage of development, but that may not have imposed a heavy drag on economic growth; (2) A bias in national saving away from physical capital accumulation and, in the Mashreq, toward human capital accumulation; (3) A very low initial income level in 1966, compared to the "balanced-growth" level predicted from international experience; and (4) A substantially higher final level of income in 1985 compared to countries with similar saving behavior and a similar starting point. Apparently, with the likely help of the regional oil boom of the 1970s, our group of countries was able to close the negative income gap they started with much faster than other countries with similar characteristics.



## ملخـــص

تختبر هذه الورقة من وجهة نظر عالمية تجربة النمو لمجموعة من الاقتصادات غير النفطية في منطقة الشرق الاوسط وشمال افريقيا –سوريا ، الاردن ، ومصر ، وتونس ، والمغرب – وذلك خلال الفترة ١٩٦٦–١٩٨٥ . ان المنهج التطبيقي الذي استخدم في الورقة يركز على اربعة متغيرات : دخل الفرد ، الاستثمار ، الالتحاق بالمدارس ، والنمو السكاني. ولقد قمنا بتحليل العلاقة بين هذه المتغيرات وبعضها البعض ، وبينها وبين متغيرات اخرى عن طريق دراسة مقطعيةتغطي حوالي تسعين دولة ، وبحثنا عما اذا كانت مجموعة الدول التي ندرسها تتوافق مع هذا النمط الدولي. واتضح لنا ان اهم السمات في المنطقة هي : (١) ارتفاع معدل الخصوبة بصورة غير عادية بالمقارنة مع دول اخرى في مرحلة متشابهة من النمو ، ولكن هذا لم يكن له تاثير سلبي على النمو الاقتصادي . (٢) اتجاه الادخار القومي في غير صالح التراكم الرأسمالي المادي ، بينما يتجه لصالح تراكم راس المال البشري في دول المشرق. (٣) بداية منخفضة لمستوى الدخل في ١٩٦٦ ، بالمقارنة بمستوى "النمو المتوازن" المتنبأ به من التجارب الدولية. (٤) مستوى دخل نهائي عالي جداً في عام ١٩٨٥ بالمقارنة بدول لها سلوك ادخاري متشابه وبدأت عند مستوى دخل متشابه. ومن الواضح ، انه وبمساعدة الطفرة النفطية التي شهدتها المنطقة في السبعينات فان مجموعة الدول هذه كانت قادرة على سد الفجوة السلبية في الدخل ،والتي بدأت بها ، اسرع كثيرا من الدول الاخرى ذات السمات المتشابهة.

## I. INTRODUCTION

This paper examines from an international perspective the growth experience of a group of "non-oil" economies in the Middle East and North Africa (MENA) region—Syria, Jordan, Egypt, Tunisia and Morocco—over the years 1966-85.[2] The empirical framework we use focuses on four central variables: per-capita income, investment, school enrollment and population growth. We estimate the relationship those variables have with each other as well as with other variables in a cross-section of nearly ninety countries, and ask whether MENA economies conform to this international pattern. Our goal is to use an international comparative framework to characterize the historic growth process in the region, and formulate a number of hypotheses than can form the basis for future research.

To analyze the determinants of per-capita income, we follow work by Mankiw, Romer and Weil (1992, henceforth MRW), who show in a cross-section of countries that a country's income is well predicted by the investment/GDP ratio, secondary school enrollment, population growth, and initial income. By introducing dummies for the region, we ask whether MENA countries fall within the pattern uncovered from the data. MRW also provide us with a useful structural interpretation of their empirical findings in terms of the traditional Solow (1956) growth model extended to encompass human as well as physical capital.

Our MENA group of countries turns out to exhibit patterns that are rather homogenous. The characteristic that, perhaps, stands out most is the group's exceptionally high fertility rates compared to other countries at a similar stage of development. The second characteristic we uncover is a bias in national saving away from physical capital accumulation and, in the Mashreq, toward human capital accumulation. Our countries have had generally lower investment and, in the Mashreq countries, higher secondary school enrollment compared to other countries with similar characteristics. This is consistent with a pattern, documented by Moore (1980) in the case of Egypt, of educating and training workers without sufficiently investing in the productive capacity needed to employ their skills.

What was the performance of our regional economies in terms of income? We answer this question in two stages. First, we examine the determination of per-capita income in 1985 *given* investment, enrollment rates, population growth and initial income. There we find that, perhaps surprisingly, our group of countries had substantially *higher* levels of income than the experience of other countries would predict.

In search for an explanation, we look in a second stage at those countries' *net* performance, after accounting for the effects on income of their unusual saving and demographic behavior and of their starting point. It appears from our regressions that the effects of unusually high population growth, low investment and high enrollment rates were limited. In particular, there is little evidence from our cross-country analysis to show that high population growth rates have imposed a very heavy drag on economic growth. This result is particularly intriguing for the region, and merits further exploration. Apparently, the strongest effect comes from the group's initial income level in 1966, which was substantially lower than the "balanced-growth" level

predicted from international experience. Once we net out the effect of their very low starting point, per-capita income in our group of countries looks close to the level predicted from international evidence. In the final analysis, what is apparently unusual about the income performance of countries in the region is, with the likely help of the regional oil boom of the 1970s, how fast they were able to close the negative income gap they started with in the mid-1960s.

The rest of the paper is organized as follows. Part II presents MRW's extended Solow model and sets up the basic framework we use for empirical analysis. Part III presents and interprets regression results for fertility, enrollments, investment and income, together with regional and country-specific dummies. Part IV concludes.

## II. Framework of Analysis

We start by presenting a simple model of growth that will constitute the main benchmark we use to interpret our empirical results. Next, we develop an empirical framework that naturally flows from this model and will be used in the rest of this paper.

### *1. An Extended Solow Model*

The model of economic growth we present is the traditional Solow (1956) model extended by MRW to encompass investment in human capital as well as physical capital. MRW assume an aggregate production function

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta}, \tag{1}$$

where $Y_t$ is output, $K_t$ and $H_t$ are physical and human capital, $L_t$ is raw labor input, and $A_t$ is the exogenously determined level of aggregate productivity, all at time $t$. Output per worker is denoted by $y_t \equiv Y_t/L_t$.

Physical and human capital accumulation follow the laws of motion

$$\frac{dK_t}{dt} = I_t - \delta K_t, \tag{2}$$

$$\frac{dH_t}{dt} = Z_t - \delta H_t, \tag{3}$$

where $I_t$ and $Z_t$ denote investment in physical and human capital, respectively, and $\delta$ is their rate of depreciation. Given the saving rates $s_k$ and $s_h$ for physical and human capital[3], we can write

$$I_t = s_k Y_t, \tag{4}$$

$$Z_t = s_h Y_t. \tag{5}$$

Finally, we denote the growth rates of the labor input and of aggregate productivity by $n > 0$ and $g > 0$, respectively.

As long as the aggregate production function exhibits diminishing returns with respect to physical and human capital, i.e. $\alpha+\beta < 1$, the economy's levels of output and capital stock converge to a history-independent balanced growth path.[4] From equations (1)-(5), it can be shown that the logarithm of per-capita output along the balanced-growth path (denoted by $y_t^*$) is given by

$$ln(y_t^*) = ln A_0 + gt - \frac{\alpha+\beta}{1-\alpha-\beta} ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta} ln(s_k) + \frac{\beta}{1-\alpha-\beta} ln(s_h). \quad (6)$$

An economy's balanced-growth level of income is a function of its physical and human capital saving rates $s_k$ and $s_h$, and of its population growth rate $n$. Countries with different parameters $s_k$, $s_h$ and $n$ will converge to different balanced-growth levels of per-capita income. However, as long as they share the same technology, they will be growing in the long run at the same exogenous rate $g$ along their balanced-growth path.[5]

On their way to the balanced-growth equilibrium, economies may grow at different rates that reflect their convergence process. Linearizing around the balanced-growth path, the speed of convergence is given by

$$\frac{d\ln(y_t)}{dt} = \lambda\left[\ln(y_t^*) - \ln(y_t)\right], \quad (7)$$

where

$$\lambda = (n+g+\delta)(1-\alpha-\beta). \quad (8)$$

Integrating (7) over $t$ years, we can express per-capita income $y_t$ as a function of the initial level $y_0$ and the balanced-growth level $y_t^*$:

$$\ln(y_t) = (1-e^{-\lambda t})\ln(y_t^*) + e^{-\lambda t}\ln(y_0). \quad (9)$$

Using equation (6), we get an expression for per-capita income off the balanced-growth path, as a function of $y_0$ and the balanced-growth level as predicted by the structural parameters $s_k$, $s_h$ and $n$:

$$ln(y_t) = (1-e^{-\lambda t})\left[ln A_0 + gt - \frac{\alpha+\beta}{1-\alpha-\beta} ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta} ln(s_k) + \frac{\beta}{1-\alpha-\beta} ln(s_h)\right] + e^{-\lambda t} ln(y_0). \quad (10)$$

## 2. *Patterns of Development in the Extended Solow Model: Specification and Data*

The extended Solow model relates a country's economic development to its saving behavior and population growth. In turn, saving and population growth may depend on the level of development already achieved. This leads to a natural empirical framework for analyzing the patterns of development across countries, consisting of four equations in the four central variables: per-capita income, physical capital investment, human capital investment, and population growth. Our object is to use this framework to see how the pattern of development in MENA countries over the period 1966-85 compares to the experience of economies outside the region.

*Per-Capita Income*

The first equation in our framework concerns the determination of per-capita income. It is based on equation (10), which expresses the log of per-capita income $\ln(y_t)$ as a function of

(i) the log of the physical capital saving rate $\ln(s_k)$;
(ii) the log of the human capital saving rate $\ln(s_h)$;
(iii) the population growth rate $n$;
(iv) the log of initial income $\ln(y_0)$.

MRW assume the parameters $\alpha$, $\beta$, $\delta$ and $g$ are common across countries, and turn equation (10) into an empirical model which they estimate using OLS.[6] MRW are very much aware of the biases that may arise in such a regression. If shocks to a country's aggregate production function are highly persistent, for example, they will affect both initial income and the error term, leading to upward bias in the coefficient on $\ln(y_0)$. Perhaps MRW's best defense are the reasonable values they obtain for the model's parameters.[7]

In our comparative study of the MENA region, we could either follow MRW in the assumption that biases are not strong, or, following Barro (1991), take an a-structural approach to our growth regressions. In the latter case, we could still ask whether MENA countries had income levels consistent with the pattern exhibited by other countries, given their saving and population growth rates. However, we would loose any structural interpretation for our results. The approach we choose to take is an eclectic one. We develop our basic interpretation under the hypothesis that biases are not too strong, but draw our conclusions with a careful eye on their sensitivity to estimation bias.

What empirical counterparts do we use for $\ln(y)$, $s_k$, $s_h$ and $n$? From an international comparative perspective, there are serious problems with comparing incomes across countries when different relative prices—between tradables and non-tradables, e.g.—are used in their respective national accounts. For this reason, we use the Real National Accounts international data constructed by Summers and Heston (1991) based on a common price structure ("international prices") across all countries. We measure $\ln(y)$ as the log of real GDP per capita in 1985 international prices. Since our period of study is 1966-85, the empirical measures of $\ln(y_t)$ and $\ln(y_0)$ will be denoted by LGDP85 and LGDP66.

For the physical capital saving rate $\log(s_k)$, we use the log of the Summers-Heston investment/GDP ratio (LINVR) averaged over the period of study. Mostly with an opportunity cost of schooling in mind, we measure the human capital saving rate $\ln(s_h)$ using the log of the secondary school enrollment rate (LENR2) averaged over the period of study. Finally, we use the average annual population growth rate over the period of study (POPG) to measure $n$.

With the exception of population growth, the determinants of output that equation (10) leads us to examine have proven robustly related to economic growth in past econometric work. Levine and Renelt (1992) show that the empirical linkage with per-capita GDP growth is quite robust for the investment ratio, secondary school enrollment and initial per-capita GDP. The linkage is more fragile for the population growth rate, and depends on what other regressors are used.

*Physical Capital Investment*

The second equation in our framework expresses the log investment ratio LINVR as a function of

(i) the log secondary school enrollment rate (LENR2);
(ii) the price level of investment goods (PI);
(iii) the economy's degree of openness (OPEN), as measured by the sum of exports and imports over GDP.

All three determinants of investment have a theoretical justification. Higher education levels may encourage investment, if the productivity of physical capital rises with the education level of the associated work-force. A higher price of investment goods may reduce the demand for investment and exhibit a negative correlation with it, as several empirical studies have shown (Barro 1991, De Long and Summers 1991). Finally, the economy's degree of openness has been shown to be robustly positively related to investment (Levine and Renelt 1992). One explanation is that a more open economy can count on a greater variety of intermediate products, that raise the return on investment. Openess can also be a measure of economic liberalization or of the international mobility of capital.

*Human Capital Investment*

Our third equation relates the log secondary school enrollment rate to

(i) the relative cost of secondary school teachers (CTEA2);
(ii) the proportion of households that is urban (URBAN);
(iii) the initial level of log per-capita income (LGDP66).

A detailed study of the cross-country determinants of enrollment rates can be found in Schultz (1985). We take our three variables from his study. The "relative cost of teachers" is meant to measure the cost of hiring a teacher relative to the cost of an average worker in the economy. It is calculated as current public expenditures on secondary schools per teacher divided by GDP per worker. As a measure of the scarcity of teachers, it should be negatively correlated with enrollment. The higher rate of urbanization may be associated with higher enrollments, either because it increases the demand for education or because it makes it cheaper to provide. Finally, higher

income levels can pay for more education, considered either as an investment or a consumption good.

*Population Growth*

We model either population growth (POPG) or fertility (FERTIL) as a function of

(i) the log secondary school enrollment rate (LENR2);
(ii) the initial level of log per-capita income (LGDP66);
(iii) the mortality rate of children below age five (MORT5);

Those variables are chosen to reflect important elements in the households' fertility choices. From this perspective, fertility is our preferred variable for this specification. Barro (1991) shows that fertility is negatively correlated with school enrollment and income. The negative association with school enrollment could be due to sociological factors that make more educated couples have fewer children. It could also be due to a tradeoff between the "quantity" and "quality" of children (see, e.g., Becker, Murphy and Tamura 1990 and Barro and Becker 1991). This last hypothesis could also explain the negative relation between fertility and income. Finally, Barro (1991) finds a positive effect of child mortality rates on gross fertility rates. His results seem to indicate that couples make their choices mostly in terms of *net* rather than *gross* fertility.

*Initial Income*

Since initial income in 1966 is used as an explanatory variable for 1985 income in equation (10), we shall also be interested in analyzing it. In particular, based on the experience of other countries, we will ask how far initial income in the region was from the balanced-growth level $y_0^*$ predicted by equation (6). In order to do that, we regress LGDP66 upon the following variables:

(i) the log average investment ratio over the period 1960-1966 (LINVR6066);
(ii) the log average school enrollment rate over the period 1960-66 (LENR26066);

Finding that, for example, $y$ in the region was significantly below the *predicted* $y^*$ in 1966 could mean that the region was really below its *true* $y^*$, or that the true $y^*$ was below its predicted level.

*Summary*

Our empirical framework models the dependence of four "explained" variables on each other and other "non-explained" variables. It also analyzes the dependence of initial per-capita income upon lagged saving rates. Table 1 summarizes the different types of variables under study. The data appendix gives more detailed information on data definition and sources.

[Table 1]

## III. Patterns of Development in the Middle East and North Africa: 1966-1985

### *1. Empirical Strategy and Data Coverage*

Our strategy is to estimate the model outlined above for a broad cross-section of countries, and control for MENA economies through dummy variables. This will help us investigate the development patterns that are *specific* to the region, taking as a benchmark the experience of our international cross-section of countries.

The period of study we selected is 1966 to 1985.[8] The cross-section of countries we chose to compare the MENA group to is the broadest available set of countries that are not "small," not "oil economies" and not "planned economies."[9] The resulting cross-section has 94 countries.

### *2. A First Look at the Data*

Before presenting our regression results, we take a first look at the data for the region. Table 2 compares MENA figures to the US and to averages for a group of 28 "middle-income" economies from our sample, defined as countries outside the region with 1985 per-capita income between 10% and 30% of the equivalent US figure.[10] This corresponds roughly to the range of 1985 per-capita income in MENA countries (ranging from 12% of US income in Egypt to 30% in Syria) and yields an average 1985 income level for the middle-income group very close to the MENA average (both at roughly 18% of the US figure).

[Table 2]

A crude look at the data in table 2 tells a story that generally anticipates our regression results. The demographic data at the top of the table reveal the significantly higher fertility rates in every MENA country (averaging 6.5 children per woman) compared to the middle-income average (4.7 children per woman). This is reflected in a higher average population growth rate.

Human capital data show below average primary enrollment and average secondary enrollment rates for the region, compared to the middle-income group. The latter hides important regional variations, with significantly above-average figures for the three Mashreq countries and below average figures in the Maghreb. Adult literacy is significantly below average, suggesting that MENA countries suffer from an important handicap in terms of their initial stock of human capital. Turning to figures on the investment/GDP ratio, we find that the region is significantly below average, with an average investment/GDP ratio of 13.6% compared to 19.0% for other middle-income economies.

Finally, the table shows data on real per-capita income in 1966 and 1985 as a fraction of the equivalent figure in 1985. Two measures of income are presented for

1985: the Summers-Heston measure based on the 1985 international price system common to all countries, and the more traditional World Bank figure that uses each country's different relative price structure and compares incomes at official exchange rates. For the average middle-income economy, moving from the World Bank to the Summers-Heston measure multiplies per-capita income relative to the US by a factor of 2.5. This is mostly due to the fact that non-tradables are cheaper relative to tradables in those countries than they are in the US. If we think of tradables as being, by their very nature, roughly priced equally across countries using official exchange rates (Purchasing Power Parity), the World Bank measure will attribute a smaller weight to non-tradables in our middle-income economies than in the US.

In principle, the difference between the two measures should be greater the more closed the economy is (which should raise the price of tradables vs. non-tradables). This is confirmed in the case of Syria and Jordan, the most closed and the most open economies in the MENA group (their openness measures are 17% and 52%, respectively). Moving from the World Bank to the Summers-Heston measures, income relative to the US rises by a factor of 2.9 in Syria and by a factor of 1.5 in Jordan, taking Syrian income far ahead of Jordan in terms of international prices.

Table 2 also calculates the annual real growth rate of per-capita income between 1966 and 1985. It is clear that the average growth rate in the region has been significantly higher than the growth rate of the average middle-income economy, a fact that we will be discussing extensively in what follows.

### *3. Fertility*

We present our empirical results in an order opposite to our model description in part II, building up from the determinants of output to the output equation. Table 3 presents our regression results for the fertility / population growth equation.

[Table 3]

OLS regression (11) uses fertility as a dependent variable and yields a high $R^2$ of 0.78, with all variables significant and of the expected sign. The MENA dummy is significant and indicates that the "average" woman in this group of countries had 1.68 more children than international patterns would predict. Turning to regression (12) with individual country dummies, we see that, with the notable exception of Egypt, the high-fertility pattern is homogenous and highly significant across the different countries in the MENA group.[11] Egypt alone seems to have a "normal" fertility level.

Regressions (13)-(14) use population growth rather than fertility as a dependent variable. They are much less successful, with a lower $R^2$ and only initial income a significant variable. This is perhaps not surprising, given that we have included variables intended to explain mostly households' fertility choices and have not included other demographic variables that relate population growth to fertility. Nevertheless, the message that comes out of equations (13)-(14) is the same as above, although less forceful. Annual population growth rates in the MENA group were about 0.56

percentage points higher than predicted. Again with the exception of Egypt, the pattern seems homogenous across the different countries in the group.

*4. School Enrollment*

We now turn to our secondary-school enrollment equation. Because we are missing the cost of teachers (CTEA2) for Jordan, we present our results with and without that variable. Regressions (15)-(16) in table 4 present results excluding the cost of teachers. Both URBAN and LGDP66 are significant and yield a high $R^2$ of 0.7. The coefficient on MENA in (15) indicates that, conditionally on URBAN and LGDP66, MENA countries appear to have had 44% more children enrolled in secondary schools than other countries. Looking at the individual-country coefficients in (16), we find that this pattern is limited to the Mashreq countries in our group, while the two Maghreb countries have more "normal" enrollment rates. Although high enrollment rates are an encouraging sign, it is quite possible that they have come at the expense of a low quality of education.

[Table 4]

If we turn to regression (17), which includes the cost of teachers, we find that, as expected, the coefficient on this last variable is significantly negative. Beyond this, none of the qualitative conclusions above are modified.

Our focus on enrollment in secondary rather than primary schools is motivated by the fact that, empirically, the former is more robustly correlated with economic growth than the latter. This does not mean that primary enrollment rates are less important, but probably that they are noisier measures that hide greater variations in the true quality of education received.[12] In fact, students of the returns to education have argued that returns are higher for primary than for secondary education (Psacharopoulos 1985).

Regression (18) looks at the determinants of log primary school enrollment rates (LENR1). None of the explanatory variables is very significant, which is consistent with our view of primary enrollment rates as a relatively noisy measure of human capital accumulation and indicates that conclusions based on those figures should be used with great caution. The pattern for MENA countries is very mixed. It is interesting to note that, comparatively speaking, Egypt seems to have a strong bias toward secondary education while Tunisia has the opposite bias toward primary education.

Enrollment rates represent a form of accumulation of human capital, but may not represent a good measure of the *stock* of human capital accumulated over time. Regression (19) looks at the literacy rate in 1985 (LIT85) as one measure of the latter, and simply regresses it over per-capita income in 1985 and the MENA country dummies. With the exception of Jordan, whose literacy rate was significantly above its predicted level, all the other MENA countries show as significant negative discrepancy with other countries ranging from 11% to 26%.[13] Thus MENA countries have

apparently had an average to above average pace of human capital accumulation, but had to make up for a very low starting point.

*5. Investment*

Regression equation (20) in table 5 looks at the determinants of the investment ratio. All variables are significant and of the expected sign, and yield an $R^2$ of 0.70. The MENA coefficient is significant and indicates that MENA countries have invested 17% less than would be predicted from the experience of other countries, when controlling for the regressors. Equation (21) shows that, with the exception of Tunisia which has a healthy above-average record, the low-investment pattern is strikingly homogenous across the other countries.

[Table 5]

Explanations for low investment in the region abound: the economic distortions that resulted from the planned development policies adopted in the 1950s and 60s; the political instabilities and frequent nationalizations that occurred over the same period; the very large share of military spending in GDP (which amounted to about 13% for the region in the mid-eighties).

*6. Per-Capita Income*

*Basic Output Equation*

We now turn to the basic output equation and present our regression results in table 6. Coefficients are significant on all explanatory variables but population growth, and yield a very high $R^2$ of 0.92. The coefficient on population growth is negative but not very significant, confirming Levine and Renelt's (1992) finding that the negative empirical relation between population and economic growth is not robust. The evidence on this last question is surveyed by Kelley and Schmidt (1992). While older studies (such as Kuznets 1967) seemed to find no correlation between population and income growth, studies based on more recent data tend to find a negative but fragile correlation. If this result is to be trusted, there are no strong grounds for being overly pessimistic about the growth performance of MENA countries because of their high fertility rates.

[Table 6]

The coefficient on initial income in regressions (22)-(23) is significantly smaller than 1, indicating that, as the modified Solow model predicts, countries "converge" in per-capita income terms *conditional* on their saving rates. However, the implied rate of convergence ($\lambda = 0.0117$) is slow and leads to highly persistent initial conditions. It

requires 59 years for a country to close half the gap between its starting income level and its balanced-growth level.

The MENA coefficient in regression (22) is highly significant, and indicates that, between 1966 and 1985, MENA countries have reached income levels that are 34% higher than their saving characteristics and starting point would predict. Regression (23) shows that this pattern of strong conditional performance in incomes is common to all countries in the region except Jordan. Going back to equation (10), the positive MENA coefficient could either mean that they converged to their balanced-growth path faster than expected, or that their balanced-growth income level is higher than one would predict. In order to examine those two hypotheses, we now turn to an analysis of the determinants of initial income in 1966.

*Initial Income*

Table 7 presents regressions of log initial income in 1966 on the log average investment ratio and enrollment rates over the period 1960-66. As mentioned previously, we interpret this equation as an estimate of the balanced-growth income level in equation (6). All coefficients in regression (24) are significant and yield an $R^2$ of 0.71. The MENA coefficient is significantly negative, and indicates that 1966 incomes in MENA countries were on average 39% below their predicted balanced-growth levels. Regression (25) shows that this pattern is significant for all countries in the MENA group except Morocco. Thus MENA countries in 1966 were either at an early stage of convergence to their balanced growth path, or were highly unproductive.

[Table 7]

*7. Summary Accounts*

Our results for the output equation suggest that, over the 1966-85 period, output performance in MENA countries has been strong, *conditionally* on investment, enrollment, population growth and initial income. But has MENA output performance been strong in *absolute* terms? In other words, once we account for their discrepancies in investment, enrollments, population growth and initial income, would we still conclude that MENA countries have performed particularly well?

To answer this question, we summarized in table 8 the discrepancies we found in the MENA group for each of our four main variables as well as initial income. Using the coefficients for the determinants of income estimated in (22), we calculated the effect of those discrepancies on income. Adding the effects on income of the different discrepancies, we arrive at a "net discrepancy" for the region.[14]

[Table 8]

The estimated effect on income growth over the period 1966-85 of the regional discrepancy in population growth is estimated at a mere -2.8%. The small magnitude of

this effect comes from the insignificant coefficient for population growth in the income equation. As we have seen, the fact that the evidence is weak for a heavy population drag on economic growth is good news for MENA countries, with their exceptionally high fertility rates.

[Table 8]

The estimated effects of discrepancies in enrollment rates and investment are +11.6% and -4.3%, respectively. It is important to keep in mind that the income equation coefficients we use for enrollment rates and investment measure the effect of those variables over a 19 year period, *given* initial income. As equation (10) makes clear, their effect would be stronger over a longer period. Nevertheless, those estimated effects are limited, especially when compared to the effect of initial income.

The effect of the negative discrepancy in initial income on final income is by far the strongest, equal to -33.7%. This effect reflects the slow conditional convergence process of incomes uncovered from the data, which leads disturbances in initial income to be highly persistent. The coefficient on initial income in equation (22) predicts that 80% of the discrepancies to 1966 income would have persisted until 1985. The effect of the regional short-fall in 1966 incomes is so strong that it eats up almost all of the 34.3% positive discrepancy in the final income equation. The *net* income performance of MENA countries, once we account for the discrepancies in the different equations, appears quite average, with a net discrepancy of only 4.4%.

A plausible hypothesis that links the discrepancies in the initial income and final income equations is as follows. MENA countries started with a significant negative income gap in 1966, either because they were far below their balanced-growth income level or because, historically, their aggregate production function had suffered an adverse shock. However, with the likely help of the regional oil-boom of the 1970s, our group of countries were able to grow (conditionally) faster than other countries and make up for most of their initial negative income gap.

One way to test this "fast catch up" hypothesis is to check whether countries within our group that had greater gaps in initial income ended up catching up faster and having a greater discrepancy in final income. To do so, we collected the residuals RESID0 from the initial income equation (excluding the dummies), and included the product MENA×RESID0 together with the MENA dummy in the final income equation. The result, presented in table 9, is a significant negative coefficient on the MENA×RESID0 product that supports our hypothesis.

[Table 9]

## IV. SUMMARY

Our international comparison of economic growth in the MENA group of countries—Syria, Jordan, Egypt, Tunisia and Morocco—over the period 1966-85 has

uncovered a significant degree of homogeneity. The main distinguishing features of the pattern of growth in MENA countries are:

(1) Exceptionally high fertility rates;

(2) Low physical investment rates coupled, for the Mashreq countries, with high school enrollment rates;

(3) A significant negative gap in initial income;

(4) High growth rates over the period of study that made up for the initial income gap.

The relatively good income performance during the period is not something that is likely to persist. It seems to be a phenomenon of "fast catch up" with the benefit of a booming regional environment. Both the initial income gap and the booming environment had disappeared by 1985.

## DATA APPENDIX

This appendix gives the definition and sources of the data used in the paper.

| | |
|---|---|
| LGDP85 | Log per-capita GDP, 1985 (using 1985 international prices; Chain index). Source: Summers-Heston (1991). |
| LGDP66 | Log per-capita GDP, 1966 (using 1985 international prices; Chain index). Source: Summers-Heston (1991). |
| LINVR | Log average real investment / GDP ratio (private and public), 1966-85 (using 1985 international prices). Source: Summers-Heston (1991). |
| LINVR6066 | Log average real investment / GDP ratio (private and public), 1960-66 (using 1985 international prices). Source: Summers-Heston (1991). |
| LENR2 | Log average secondary school enrollment rate, 1966-85. Source: World Bank. |
| LENR26066 | Log average secondary school enrollment rate, 1960-66. Source: World Bank. |
| POPG | Annual population growth rate (%), 1966-85. Source: Summers-Heston (1991). |
| FERTIL | Average fertility rate, 1966-85. Source: World Bank. |
| PI | Price level of investment, 1975. Source: Summers-Heston (1991). |
| OPEN | Openness (exports + imports)/GDP (current international prices). Source: Summers-Heston (1991). |
| URBAN | Average proportion of households that is urban, 1966-85. Source: World Bank. |
| CTEA2 | Relative cost of secondary school teachers, 1966. It is calculated as Current public expenditure on secondary schools per teacher / GDP per worker. Sources: UNESCO Yearbooks and World Bank. |
| MORT5 | Average below-five child mortality rate, 1966-85. Source: World Bank. |
| EGY | Dummy variable for Egypt. |
| JOR | Dummy variable for Jordan. |
| MAR | Dummy variable for Morocco. |
| SYR | Dummy variable for Syria. |
| TUN | Dummy variable for Tunisia. |
| MENA | Dummy variable for the MENA group of countries (Egypt, Jordan, Morocco, Syria and Tunisia). |

# ENDNOTES

[1]Paper written for the Cairo Conference of the Initiative to Encourage Economic Research on the Middle East and North Africa, June 1993. This paper was written while Mohamad Hammour was visiting at DELTA. We thank Hélène Bouaziz and Dorte Werner for their excellent research assistance, and Jess Benhabib, Hanaa Khair-el-Din, Hashem Pesaran, Antoine Zahlan and participants at the Cairo conference for helpful comments. All errors are our sole responsibility.

[2]For three general references on economic growth in the MENA region, see Richards and Waterbury (1990), Sa'diddin et al. (1989) and Barlow (1982). At several points in their book (see pp. 85, 108, 115, e.g.), Richards and Waterbury adopt an international comparative approach to the region in the spirit what we propose to do more systematically here.

[3]By relating investment to domestic saving rates, we are implicitly assuming imperfect capital mobility. This correlation between investment and domestic saving was documented empirically by Feldstein and Horioka (1980).

[4]If $\alpha+\beta = 1$, the economy exhibits "endogenous growth," in the sense that per-capita output may exhibit sustained growth even in the absence of growth in exogenous productivity $A_t$ (see, e.g., Romer 1990 and Lucas 1988). In this case, the economy's balanced growth path becomes history-dependent: countries that are otherwise similar may not converge to the same level of per-capita income, if they did not start at the same level.

[5]Again, this would not hold if $\alpha+\beta = 1$. In that case, higher saving countries would be growing faster along their balanced growth path.

[6]Strictly speaking, equation (10) is non-linear in $n$ because it enters through the term $\ln(n + g + \delta)$ and because $\lambda$ is itself a function of $n$ (see equation 8). Our estimated equation can be thought of as a linearization of (10).

[7]This is true for their estimates of both equations (9) and (10). As far as equation (10) is concerned, the implied parameter restrictions are not rejected. MRW's "restricted" regression estimated with their "intermediate" sample implies values for $\alpha$, $\beta$ and $\lambda$ equal to 0.44, 0.23 and 0.0142, respectively.

[8]For most countries, Summers-Heston data start in 1960. We reserved the period 1960-66 to get lagged investment data for the study of initial income.

[9]We define a "small" economy as one that had a population less than 1 million in 1985. The other restrictions rule out the following countries: Algeria, Angola, Bahrain, Congo, Gabon, Iran, Iraq, Kuwait, Liberia and Saudi Arabia ("oil economies"); China, Hungary, Poland and Yugoslavia ("planned economies"). Finally, we excluded Afghanistan because of the Soviet invasion, and Lesotho because "the sum of private and government consumption far exceed GDP in every year of the sample, indicating that labor income from abroad constitutes an extremely large fraction of GNP" (MRW, fn. 5, p. 413).

[10]The countries that make up the "middle-income" group are Argentina, Botswana, Brazil, Cameroon, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Indonesia, Jamaica, the Republic of Korea, Malaysia, Mauritius, Nicaragua, Panama, Paraguay, Peru, the Philippines, Portugal, South Africa, Sri Lanka, Thailand, Turkey and Uruguay.

[11]Richards and Waterbury (1990, p. 85) obtain a similar result.

[12]For example, the compulsory nature of primary education in many countries may lead to very low educational standards and/or to government inflation of actual enrollment figures to include students who simply *ought* to be enrolled.

[13]This confirms the similar result in Richards and Waterbury (1990), p. 115.

[14]In our net-discrepancy calculations, we took account direct as well as *indirect* effects. For example, besides its direct effect on income, the discrepancy in enrollments also affects income indirectly through the investment and population-growth equations.

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TABLE 1
"Explained" and "Non-explained" Variables

| Variable | Symbol |
|---|---|
| *Explained Variables* | |
| (1) Log per-capita income, 1985 | LGDP85 |
| (2) Log avg. investment ratio, 1966-85 | LINVR |
| (3) Log avg. secondary school enrollment rate, 1966-85 | LENR2 |
| (4) Avg. population growth / fertility rate, 1966-85 | POPG / FERTIL |
| *Non-explained Variables* | |
| (1) Price of investment goods, 1975 | PI |
| (2) Economy's degree of openness | OPEN |
| (3) Avg. proportion of households that is urban, 1966-85 | URBAN |
| (4) Relative cost of secondary school teachers, 1966 | CTEA2 |
| (5) Avg. below-five child mortality, 1966-85 | MORT5 |
| *Lagged Variables* | |
| (1) Initial log avg. investment ratio, 1960-66 | LINVR6066 |
| (2) Initial log avg. sec. school enrollment rate, 1960-66 | LENR26066 |

TABLE 2
MENA Economic Development Data: 1966-85

| | Syria | Jordan | Egypt | Tunisia | Morocco | Average MENA | Average Middle Income[a] | USA |
|---|---|---|---|---|---|---|---|---|
| *Population Growth* | | | | | | | | |
| Population, 1966 (millions) | 5.5 | 2.0 | 30.2 | 4.7 | 13.9 | 11.3 | 17.2 | 196.6 |
| Population, 1985 (millions) | 10.5 | 3.5 | 47.6 | 7.3 | 22.1 | 18.2 | 26.4 | 239.3 |
| Population Growth, 1966-85 (% per yr.) | 3.44 | 2.93 | 2.42 | 2.30 | 2.46 | 2.71 | 2.25 | 1.04 |
| Fertility, 1966-85 | 7.47 | 7.46 | 5.49 | 5.75 | 6.21 | 6.47 | 4.69 | 2.02 |
| *Human Capital* | | | | | | | | |
| Primary Sch. Enrollment, 1966-85 (%) | 94 | - | 77 | 104 | 64 | - | 100 | 99 |
| Secondary Sch. Enrollment (%) | 49 | 75 | 51 | 28 | 24 | 45 | 42 | 94 |
| Secondary Sch. Enrollment, 1960-66 (%) | 24 | 34 | 23 | 15 | 9 | 21 | 23 | 87 |
| Adult Literacy, 1985 (%) | 60 | 75 | 45 | 54 | 33 | 53 | 75 | 99 |
| *Investment* | | | | | | | | |
| Investment/GDP, 1966-85 | 17.7 | 19.4 | 6.3 | 15.3 | 9.4 | 13.6 | 19.1 | 17.3 |
| Investment/GDP, 1960-66 | 14.7 | 6.5 | 6.1 | 17.9 | 5.3 | 10.1 | 15.3 | 16.3 |
| *Per-Capita Income /1985 US Income* | | | | | | | | |
| Income at 1985 intern'l prices, 1966[b] | 0.125 | 0.114 | 0.042 | 0.096 | 0.073 | 0.090 | 0.121 | 0.726 |
| Income at 1985 intern'l prices, 1985[b] | 0.299 | 0.163 | 0.115 | 0.185 | 0.120 | 0.176 | 0.184 | 1.000 |
| Income at official exchange rates, 1985[c] | 0.102 | 0.112 | 0.039 | 0.070 | 0.036 | 0.072 | 0.075 | 1.000 |
| Growth at '85 int. pr., 1966-85 (% per yr.) | 4.69 | 1.87 | 5.48 | 3.51 | 2.67 | 3.65 | 2.54 | 1.70 |
| *Other Variables* | | | | | | | | |
| Under 5 Child Mortality (%) | 7.1 | 6.4 | 11.6 | 6.5 | 10.1 | 8.3 | 5.6 | 1.3 |
| Urban Population, 1966-85 (% of tot.) | 45.4 | 55.8 | 43.6 | 47.7 | 38.3 | 46.2 | 44.2 | 73.5 |
| Price of Investment Goods, 1975 | 61 | 72 | 229 | 123 | 133 | 124 | 75 | 100 |
| Openness, 1966-85 (%) | 17.1 | 52.2 | 25.3 | 32.1 | 23.1 | 25.3 | 29.9 | 18.0 |

*Notes:*

[a]The group of 28 "middle-income" economies used is the broadest available group of countries from our sample (excluding MENA countries) whose 1985 per-capita income (in 1985 international prices) was between 10% and 30% of the U.S. figure. For each variable, the middle-income "average" is taken over countries for which data were available.

[b]Real per-capita GDP measured in terms of Summers-Heston 1985 international prices, as a fraction of the equivalent US figure for 1985.

[c]Per-capita GNP at official exchange rates from the World Bank Tables, as a fraction of the equivalent US figure for 1985.

TABLE 3
Fertility / Population Growth Equation

| Eqn. | (11) | (12) | (13) | (14) |
|---|---|---|---|---|
| Dep. Variable. | FERTIL | FERTIL | POPG | POPG |
| No. of Obs. | 94 | 94 | 94 | 94 |
| Constant | 11.32 | 11.62 | 6.39 | 6.53 |
| | (8.64) | (8.86) | (6.00) | (6.09) |
| LENR2 | -0.381 | -0.372 | -0.143 | -0.144 |
| | (-1.91) | (-1.85) | (-0.97) | (-0.93) |
| MORT5 | 8.21 | 8.10 | 0.648 | 0.549 |
| | (3.56) | (3.48) | (0.34) | (0.28) |
| LGDP66 | -0.799 | -0.842 | -0.519 | -0.537 |
| | (-4.81) | (-5.16) | (-4.35) | (-4.46) |
| MENA | 1.68 | | 0.561 | |
| | (2.86) | | (1.95) | |
| SYR | | 3.16 | | 1.53 |
| | | (28.98) | | (18.04) |
| JOR | | 3.30 | | 1.04 |
| | | (19.13) | | (8.44) |
| EGY | | -0.09 | | -0.09 |
| | | (-0.35) | | (-0.54) |
| TUN | | 1.05 | | 0.17 |
| | | (8.45) | | (1.70) |
| MAR | | 0.93 | | 0.14 |
| | | (8.55) | | (1.74) |
| $R^2$ | 0.78 | 0.80 | 0.48 | 0.50 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

TABLE 4
Human Capital Equation

| Eqn. | (15) | (16) | (17) | (18) | (19) |
|---|---|---|---|---|---|
| Dep. Variable. | LENR2 | LENR2 | LENR2 | LENR1 | LIT85 |
| No. of Obs. | 94 | 94 | 65 | 65 | 68 |
| Constant | -0.819 | -0.967 | -0.968 | 3.10 | -57.8 |
| | (-1.04) | (-1.20) | (-1.41) | (5.74) | (-2.58) |
| URBAN | 0.0146 | 0.0137 | 0.00928 | 0.00457 | |
| | (3.20) | (2.97) | (2.40) | (1.82) | |
| CTEA2 | | | -0.00509 | -0.00354 | |
| | | | (-2.63) | (-2.58) | |
| LGDP66 | 0.473 | 0.498 | 0.541 | 0.148 | |
| | (3.72) | (3.84) | (5.30) | (1.84) | |
| LGDP85 | | | | | 15.3 |
| | | | | | (4.95) |
| MENA | 0.439 | | | | |
| | (2.30) | | | | |
| SYR | | 0.427 | 0.307 | 0.101 | -12.63 |
| | | (7.81) | (4.93) | (2.55) | (-2.61) |
| JOR | | 0.750 | | | 11.68 |
| | | (11.90) | | | (3.45) |
| EGY | | 1.043 | 0.959 | 0.067 | -13.52 |
| | | (7.64) | (7.24) | (0.67) | (-4.84) |
| TUN | | -0.044 | -0.145 | 0.233 | -11.08 |
| | | (-0.72) | (-2.02) | (4.80) | (-3.03) |
| MAR | | 0.058 | -0.065 | -0.166 | -25.55 |
| | | (0.83) | (-0.75) | (-2.85) | (-8.96) |
| $R^2$ | 0.68 | 0.70 | 0.76 | 0.54 | 0.32 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

TABLE 5
Investment Equation
(Dependent Variable: LINVR)

| Eqn. | (20) | (21) |
|---|---|---|
| No. of Obs. | 93 | 93 |
| Constant | 2.21 | 2.19 |
| | (14.83) | (14.44) |
| LENR2 | 0.229 | 0.232 |
| | (5.42) | (5.43) |
| PI | -0.00478 | -0.00472 |
| | (-5.71) | (-5.49) |
| OPEN | 0.739 | 0.735 |
| | (4.62) | (4.55) |
| MENA | -0.165 | |
| | (-1.89) | |
| SYR | | -0.062 |
| | | (-1.24) |
| JOR | | -0.272 |
| | | (-5.44) |
| EGY | | -0.380 |
| | | (-3.00) |
| TUN | | 0.105 |
| | | (2.42) |
| MAR | | -0.228 |
| | | (-4.13) |
| $R^2$ | 0.70 | 0.70 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

TABLE 6
Output Equation
(Dependent Variable: LGDP85)

| Eqn. | (22) | (23) |
|---|---|---|
| No. of Obs. | 94 | 94 |
| Constant | 0.522 | 0.434 |
| | (1.28) | (1.04) |
| LINVR | 0.263 | 0.278 |
| | (3.43) | (3.51) |
| LENR2 | 0.198 | 0.193 |
| | (2.84) | (2.66) |
| POPG | -0.0500 | -0.0539 |
| | (-1.24) | (-1.05) |
| RGDP66 | 0.800 | 0.807 |
| | (11.09) | (11.04) |
| MENA | 0.343 | |
| | (2.62) | |
| SYR | | 0.518 |
| | | (5.94) |
| JOR | | -0.146 |
| | | (-1.53) |
| EGY | | 0.684 |
| | | (5.82) |
| TUN | | 0.353 |
| | | (9.66) |
| MAR | | 0.318 |
| | | (7.50) |
| $R^2$ | 0.92 | 0.93 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

TABLE 7
Initial Income Equation
(Dependent Variable: LGDP66)

| Eqn. | (24) | (25) |
|---|---|---|
| No. of Obs. | 88 | 88 |
| Constant | 5.50 | 5.52 |
| | (25.02) | (24.53) |
| LINVR6066 | 0.248 | 0.233 |
| | (2.28) | (2.04) |
| LENR26066 | 0.537 | 0.545 |
| | (8.34) | (8.18) |
| MENA | -0.377 | |
| | (-2.11) | |
| SYR | | -0.235 |
| | | (-3.71) |
| JOR | | -0.319 |
| | | (-2.17) |
| EGY | | -1.100 |
| | | (-8.34) |
| TUN | | -0.279 |
| | | (-4.63) |
| MAR | | -0.002 |
| | | (-0.02) |
| $R^2$ | 0.71 | 0.72 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

TABLE 8
MENA Regional Discrepancies
and their Effect on 1985 Income

| Variable | Discrepancy | Effect on 1985 Income | Net Discrepancy |
|---|---|---|---|
| Population Growth | 0.561 | -0.028 | |
| Enrollment | 0.439 | 0.116 | |
| Investment | -0.165 | -0.043 | |
| Initial Income | -0.377 | -0.337 | |
| Final Income | 0.343 | 0.343 | 0.051 |

TABLE 9
Test of the "Fast Catch Up" Hypothesis
(Dependent Variable: LGDP85)

| Eqn. | (26) |
|---|---|
| No. of Obs. | 87 |
| Constant | 0.302 |
| | (0.66) |
| LINVR | 0.268 |
| | (3.17) |
| LENR2 | 0.222 |
| | (2.86) |
| POPG | -0.0377 |
| | (-0.87) |
| LGDP66 | 0.811 |
| | (10.20) |
| MENA | 0.214 |
| | (1.43) |
| MENA×RES0 | -0.397 |
| | (-2.32) |
| $R^2$ | 0.92 |

*Note:* Heteroskedastic-consistent t-statistics shown in parentheses.

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